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Patent

Claims

What is claimed is:

1. A MEMS acoustic actuator comprising:

5 a substrate;

an acoustic wave generator for generating an acoustic wave, said acoustic wave generator being disposed on the substrate; and

10 a moveable element for receiving the acoustic wave, said moveable element being operatively connected to the acoustic wave generator such that the acoustic wave generator is capable of exerting sufficient acoustic radiation pressure for moving said moveable element.

15 2. The MEMS acoustic actuator as defined in claim 1 wherein the moveable element comprises a planar surface for receiving and deflecting the acoustic wave.

3. The MEMS acoustic actuator as defined in claim 2 wherein the substrate comprises a cavity for accommodating the acoustic wave generator and for directing the acoustic wave to the planar surface.

20 4. The MEMS acoustic actuator as defined in claim 2 further comprising another substrate for supporting the moveable element.

25 5. The MEMS acoustic actuator as defined in claim 4 further including substrate joining bonds for joining the substrate and the other substrate and for providing a sufficient separation between the acoustic wave generator and the moveable element.

6. The MEMS acoustic actuator as defined in claim 3 further comprising fastening means for moveably attaching the moveable element to the substrate.

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7. The MEMS acoustic actuator as defined in claim 6 wherein the fastening means is one of a ligature, a cantilever, and a hinge.

8. The MEMS acoustic actuator as defined in claim 4 further comprising fastening means for moveably attaching the moveable element to the other substrate.

9. The MEMS acoustic actuator as defined in claim 8 wherein the fastening means is one of a ligature, a cantilever, and a hinge

10. The MEMS acoustic actuator as defined in claim 2 further comprising control means for controlling a movement of the moveable element.

11. The MEMS acoustic actuator as defined in claim 10 wherein the control means is an electrostatic latch for holding the moveable element in a vertical position.

12. The MEMS acoustic actuator as defined in claim 10 wherein the control means comprise a sensor for detecting a position of a beam of light and a feedback circuit for providing the detected position to the control means, said control means for adjusting the position of the moveable element in dependence upon the detected position.

13. The MEMS acoustic actuator as defined in claim 2 comprising at least 3 acoustic wave generator for providing movement of the moveable element in two axes.

14. The MEMS acoustic actuator as defined in claim 2 wherein the moveable element is one of a mirror, a waveguide, a diffraction grating, a holographic optical element, a Fresnel lens, and a valve.

15. The MEMS acoustic actuator as defined in claim 2 wherein the radiation pressure is between 100 to 1000 Pa.

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16. The MEMS acoustic actuator as defined in claim 2 wherein the acoustic wave generator is capable of generating a sound intensity level of 150 dB at a frequency of approximately 5 MHz.
- 5 17. A method of actuating a MEMS device comprising the steps of:
- launching an acoustic wave; and
 - receiving the acoustic wave with a moveable element such that the acoustic wave exerts sufficient radiation pressure for moving said moveable element.

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